

**Supplementary Table S1.** Patient characteristics

			Pressure Injuries				P value
			Non-HAPI patients (N =15,404)		HAPI patients (N = 485)		
	Risk Factors	Sub-factors (if categorical)	N or mean	% or SD	N or mean	% or SD	
Demographics	Sex	Female	7233	46.96	195	40.21	<0.01
		Male	8171	53.04	290	59.79	
	Race	White	10045	65.21	310	63.92	0.73
		Black	4359	28.30	148	30.52	
		Multiracial	127	0.82	4	0.82	
		Other	856	5.56	23	4.74	
		Declined	17	0.11	0	0.00	
	Ethnic Group	Not Hispanic or Latino	14637	95.02	457	94.23	0.53
		Hispanic or Latino	752	4.88	28	5.77	
		Declined	15	0.10	0	0.00	
	Age	N/A	66.5	16.40	68.9	14.1	<0.01
Medical	American Society of Anesthesiologists (ASA) Score	Low	13086	84.95	333	68.66	<0.01
		Mid	742	4.82	59	12.16	
		High	1576	10.23	93	19.18	
	Emergency Department Length-of-Stay	N/A	10.15	7.63	10.09	7.86	0.36
	ICU During Encounter	Yes	4274	27.75	269	55.46	<0.01
		No	11130	72.25	216	44.54	
	Number of Surgeries	N/A	0.30	0.62	0.80	1.33	<0.01
	Palliative Orders	Yes	1888	12.26	186	38.35	<0.01
		No	13516	87.74	299	61.65	
	Prior Year Inpatient Visit	N/A	1.12	1.96	0.95	1.53	0.02
	Steroid History	Yes	5050	32.78	148	30.52	0.29
		No	10354	67.22	337	69.48	
	Transitional During Encounter	Yes	2541	16.50	170	35.05	<0.01
		No	12863	83.50	315	64.95	
Number of Pressure Injuries	N/A	0.20	1.20	0.50	1.96	<0.01	
Diagnosis	Comorbidity	N/A	7.36	4.55	7.83	4.46	0.02
	Depression	Yes	4988	32.38	135	27.84	0.04
		No	10416	67.62	350	72.16	
	Diabetes	Yes	7441	48.31	258	53.20	0.03
		No	7963	51.69	227	46.80	
	Renal Failure	Yes	7502	48.70	315	64.95	<0.01
		No	7902	51.30	170	35.05	

	Sepsis Diagnosis	Yes	1404	9.11	118	24.33	<0.01
		No	14000	90.89	367	75.67	
	Stroke History	Yes	2123	13.78	114	23.51	<0.01
		No	13281	86.22	371	76.49	
	Pressure Injury upon Admission	Yes	947	6.15	68	14.02	<0.01
		No	14457	93.85	417	85.98	
Labs	Albumin (First)	N/A	3.53	0.58	3.26	0.65	<0.01
	Albumin (Most Recent)	N/A	3.35	0.57	2.90	0.58	<0.01
	Albumin (Average)	N/A	3.40	0.54	2.94	0.52	<0.01
	Blood Urea Nitrogen (BUN) (First)	N/A	28.50	23.40	33.90	26.30	<0.01
	BUN (Most Recent)	N/A	26.80	22.30	30.90	25.20	<0.01
	BUN (Average)	N/A	27.80	19.40	33.50	19.10	<0.01
	C-reactive Protein (First)	N/A	25.90	66.80	44.90	86.10	<0.01
	C-reactive Protein (Most Recent)	N/A	13.90	47.60	24.50	58.30	<0.01
	C-reactive Protein (Average)	N/A	20.10	52.50	33.60	63.90	<0.01
	Creatine Serum (First)	N/A	1.68	2.00	2.12	2.57	<0.01
	Creatine Serum (Most Recent)	N/A	1.43	1.56	1.50	1.65	0.356
	Creatine Serum (Average)	N/A	1.51	1.62	1.69	1.73	0.022
	Hemoglobin (First)	N/A	11.91	2.61	11.72	2.59	0.107
	Hemoglobin (Most Recent)	N/A	10.90	2.79	9.88	2.02	<0.01
	Hemoglobin (Average)	N/A	11.09	2.21	10.13	1.85	<0.01
	Lactate (First)	N/A	1.31	1.87	1.82	2.30	<0.01
	Lactate (Most Recent)	N/A	1.14	1.63	1.55	2.07	<0.01
	Lactate (Average)	N/A	1.22	1.56	1.68	1.87	<0.01
	Sodium (First)	N/A	136.89	5.51	136.37	6.67	0.094
	Sodium (Most Recent)	N/A	138.80	4.06	138.78	4.73	0.938
	Sodium (Average)	N/A	138.58	3.98	139.01	4.48	0.037
Medications	High Mean Arterial Pressure (MAP)	Yes	2877	18.68	178	36.70	<0.01
		No	12527	81.32	307	63.30	
	Opioids	Yes	8791	57.07	384	79.18	<0.01
		No	6613	42.93	101	20.82	
	Steroid Use	Yes	8050	52.26	354	72.99	<0.01
		No	7354	47.74	131	27.01	
	Stimuli Anesthesia	Yes	2170	14.09	148	30.52	<0.01
		No	13234	85.91	337	69.48	
	Stimuli Paralytics	Yes	842	5.47	76	15.67	<0.01
		No	14562	94.53	409	84.33	
	Stimuli Sedation	Yes	2870	18.63	201	41.44	<0.01

Medical Devices		No	12534	81.37	284	58.56	<0.01
	Stimuli Tracheostomy	Yes	488	3.17	80	16.49	
			No	14916	96.83	405	
	Vasopressor	Yes	4306	27.95	287	59.18	<0.01
		No	11098	72.05	198	40.82	
	Artificial Air Management	Yes	2842	18.45	201	41.44	<0.01
		No	12562	81.55	284	58.56	
	Face Mask	Yes	4579	29.73	283	58.35	<0.01
		No	10825	70.27	202	41.65	
	Nasal Cannula	Yes	10398	67.50	393	81.03	<0.01
		No	5006	32.50	92	18.97	
	Noninvasive Ventilation	Yes	41	0.27	0	0.00	0.26
		No	15363	99.73	485	100.00	
	Pharyngeal	Yes	9	0.06	2	0.41	<0.01
		No	15395	99.94	483	99.59	
	Room Air	Yes	14374	93.31	459.000	94.64	0.25
		No	1030	6.69	26	5.36	
	Ventilator	Yes	2830	18.37	199.00	41.03	<0.01
		No	12574	81.63	286	58.97	
	Feeding Tube	Yes	1735	11.26	207.00	42.68	<0.01
No		13669	88.74	278	57.32		
Assessments	Blood Pressure Systolic (First)	N/A	135	29.20	128	30.20	<0.01
	Blood Pressure Systolic (Most Recent)	N/A	125	22.20	120	23.00	<0.01
	Blood Pressure Systolic (Average)	N/A	127	16.40	122	14.70	<0.01
	Blood Pressure Diastolic (First)	N/A	78	17.60	74	18.20	<0.01
	Blood Pressure Diastolic (Most Recent)	N/A	72	12.50	68	13.60	<0.01
	Blood Pressure Dias-tolic (Average)	N/A	73	8.78	69	7.80	<0.01
	Body Mass Index (BMI)	N/A	29	25.00	26	8.46	<0.01
	Count of Glasgow Coma Score (GCS)						
	Comment of Intubated or Chemically Paralyzed	N/A	899	1,126.00	2968	3,182.00	<0.01
	Glasgow Coma Score (GCS) (First)	N/A	14	1.73	13	2.39	<0.01
	Glasgow Coma Score (GCS) (Most Recent)	N/A	3	0.57	3	0.58	<0.01
	Glasgow Coma Score (GCS) (Average)	N/A	14	1.73	13	2.39	<0.01

Patient Refusal to Change Position	Yes	4466	28.99	272	56.08	<0.01
	No	10938	71.01	213	43.92	
Pulse Oximetry (First)	N/A	95.86	5.08	96	5.09	0.80
Pulse Oximetry (Most Recent)	N/A	94.96	6.58	94	90.08	0.12
Pulse Oximetry (Average)	N/A	96.02	2.13	96	1.89	<0.01
Skin Abnormality on Admission	Yes	15384	99.87	485	100.00	0.43
	No	20	0.13	0	0.00	
Body Temperature (First)	N/A	37	0.81	37	1.51	<0.01
Body Temperature (Most Recent)	N/A	37	0.55	37	1.42	<0.01
Body Temperature (Average)	N/A	37	0.26	37	0.25	<0.01
Weight Loss	Yes	729	0.05	34	0.07	0.02
	No	14675	0.95	451	0.93	
Overall Braden Score (First)	Risky (<18)	6393	41.50	307	63.30	<0.01
	Non-Risky (≥18)	9011	58.50	178	36.70	
Overall Braden Score (Most Recent)	Risky (<18)	5693	36.96	359	74.02	<0.01
	Non-Risky (≥18)	9711	63.04	126	25.98	
Overall Braden Score (Average)	Risky (<18)	11325	73.52	479	98.76	<0.01
	Non-Risky (≥18)	4079	26.48	6	1.24	
Sensory Perception Status (First)	Completely Limited	577	3.75	56	11.55	<0.01
	Very Limited	1031	6.69	39	8.04	
	Slightly Limited	3343	21.70	129	26.60	
	No Impairment	10453	67.86	261	53.81	
Sensory Perception Status (Most Recent)	Completely Limited	633	4.11	53	10.93	<0.01
	Very Limited	814	5.28	79	16.29	
	Slightly Limited	3313	21.51	136	28.04	
	No Impairment	1044	6.78	217	44.74	
Sensory Perception Status (Average)	Completely Limited	392	2.54	34	7.01	<0.01
	Very Limited	1488	9.66	144	29.69	
	Slightly Limited	8768	56.92	277	57.11	
	No Impairment	4756	30.88	30	6.19	
Skin Moisture/ Circulation/ Excretion Status (First)	Constantly Moist	124	0.80	7	1.44	<0.01
	Often Moist	1051	6.82	47	9.69	
	Often Moist	4466	28.99	201	41.44	
	Rarely Moist	9763	63.38	230	47.42	
Skin Moisture/ Circulation/ Excretion Status (Most Recent)	Constantly Moist	78	0.51	8	1.65	<0.01
	Often Moist	757	4.91	61	12.58	
	Often Moist	4051	26.30	234	48.25	

		Rarely Moist	10518	68.28	182	37.53	
	Skin Moisture/ Circulation/ Excretion Status (Average)	Constantly Moist	12	0.08	0.00	0.00	<0.01
		Often Moist	1893	12.29	139	28.66	
		Often Moist	8097	52.56	323	66.60	
		Rarely Moist	5402	35.07	23	4.74	
	Activity Status (First)	Bedfast	3429	22.26	172	35.46	<0.01
		Chairfast	1877	12.19	87	17.94	
		Walks Occasionally	6840	44.40	174	35.88	
		Walks Frequently	3258	21.15	52	10.72	
	Activity Status (Most Recent)	Bedfast	2362	15.33	182	37.53	<0.01
		Chairfast	2418	15.70	146	30.10	
		Walks Occasion- ally	7619	49.46	137	28.25	
		Walks Frequently	3005	19.51	20	4.12	
	Activity Status (Average)	Bedfast	3690	23.95	276	56.91	<0.01
		Chairfast	5384	34.95	179	36.91	
		Walks Occasion- ally	6145	39.89	30	6.19	
		Walks Frequently	185	1.20	0.00	0.00	
	Mobility Status (First)	Completely Immobile	692	4.49	49	10.10	<0.01
		Very Limited	2392	15.53	125	25.77	
		Slightly Limited	6142	39.87	195	40.21	
		No Limitations	6178	40.11	116	23.92	
	Mobility Status (Most Recent)	Completely Immobile	819	5.32	66	13.61	<0.01
		Very Limited	1857	12.06	131	27.01	
		Slightly Limited	6353	41.24	220	45.36	
		No Limitations	6375	41.39	68	14.02	
	Mobility Status (Average)	Completely Immobile	770	5.00	72	14.85	<0.01
		Very Limited	4199	27.26	290	59.79	
		Slightly Limited	8744	56.76	121	24.95	
		No Limitations	1691	10.98	2	0.41	
	Nutrition Status (First)	Very Poor	596	3.87	36	7.42	<0.01
		Probably Inadequate	2293	14.89	112	23.09	
		Adequate	9477	61.52	269	55.46	
		Excellent	3038	19.72	68	14.02	
	Nutrition Status (Most Recent)	Very Poor	579	3.76	29	5.98	<0.01
		Probably Inade- quate	1345	8.73	84	17.32	
		Adequate	11084	71.96	326	67.22	
		Excellent	2396	15.55	46	9.48	

	<b>Nutrition Status (Average)</b>	<b>Very Poor</b>	350	2.27	17	3.51	<b>&lt;0.01</b>
		<b>Probably Inadequate</b>	6084	39.50	349	71.96	
		<b>Adequate</b>	8927	57.95	119	24.54	
		<b>Excellent</b>	43	0.28	0.00	0.00	
	<b>Friction and Shear Status (First)</b>	<b>Problem</b>	821	5.33	47	9.69	<b>&lt;0.01</b>
		<b>Potential Problem</b>	4745	30.80	210	43.30	
		<b>No Apparent Problem</b>	9838	63.87	228	47.01	
	<b>Friction and Shear Status (Most Recent)</b>	<b>Problem</b>	1085	7.04	163	33.61	<b>&lt;0.01</b>
		<b>Potential Problem</b>	4767	30.95	203	41.86	
		<b>No Apparent Problem</b>	9552	62.01	119	24.54	
	<b>Friction and Shear Status (Average)</b>	<b>Problem</b>	2100	13.63	224	46.19	<b>&lt;0.01</b>
		<b>Potential Problem</b>	8973	58.25	257	52.99	
		<b>No Apparent Problem</b>	4331	28.12	4	0.82	

SD: Standard deviation, Gray color: Risk Factor selected by machine learning, Bold P value: statistically significant ( $< 0.05$ ), N/A: Continuous factors; no sub-categories (t-test, otherwise it is categorical: Chi-square test), First: risk factors/diagnosis upon admission, Last: Most recent diagnosis before discharge, Average: the average of all observed values during visit.